

Please reply to Genetics Bldg.

Dr. Fred L. Whipple  
Harvard College Observatory  
Cambridge, Mass.

Dear Dr. Whipple:

I have lately become interested in the much mooted question of prebiotic synthesis of organic (carbonaceous) molecules. At least since Oparin's first book there has, of course, been much attention given to the activation of the simple hydrides by ultraviolet light and related processes in the atmosphere of the already formed earth. Without wishing to diminish the importance of these processes, I have however been wondering if such synthesis might be occurring on a much grander scale as part of the evolution of the interstellar grains.

Your own work on the composition of comets has particularly fascinated me, as it furnishes some hope of eventual verification of this model, insofar as the satellite program may lead to the retrieval of interplanetary dust for chemical analysis — except for the lightest components, the surface of the moon will be of course an abundant source.

My main question is your present thought of the molecular chemistry of the interstellar grains (and of the cometary substance which, I gather, you would consider to be of comparable composition). In your "Comet model. II.", 1951, you wrote that "Lacking at present sufficient information to estimate the frequency distribution of the various molecules of H, C, N, and O the writer has arbitrarily assumed that the major mass is in the form of  $\text{CH}_4$ ,  $\text{NH}_3$ , and  $\text{H}_2\text{O}$ ." Does this then leave open the plausible possibility of the existence of much larger molecules as an appreciable part of the total composition? The reduced abundance of H in the comet perhaps makes this more plausible for the comet than for the interstellar grain.

My comprehension of the astrophysical literature is bound to be shamefully naive and uncritical, but I cannot readily decide whether the chemistry of larger molecules has simply been overlooked (perhaps intentionally on account of its complexity or inaccessibility) or whether there are good reasons to limit discussion to the simple hydrides. I am speaking, of course, of situations where the particle temperature and the radiation flux are relatively small. When interstellar grains are referred to as aggregates of H C N and O I can't help wondering if they might not be immense macromolecules.

If you can still furnish reprints of your Comet-Model and related papers, I would be most grateful for them, as I will have to spend more time on them than I can conveniently do in the library.

Yours sincerely,

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Medical Genetics

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